FORM PTO-1390 (REV. 5-93)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER
11150/22

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TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)
09/674839

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATES CLAIMED
PCT/EP99/03031	**04.05.99** **04 May 1999**	**06.05.98** **06 May 1998** **18.06.98** **18 June 1998**

TITLE OF INVENTION
METHOD AND DEVICE FOR OPERATING VOICE-CONTROLLED SYSTEMS IN MOTOR VEHICLES

APPLICANT(S) FOR DO/EO/US
SCHAAF, Klaus; SCHULTZ, Jürgen; THÖRMANN, Volker

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) immediately rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau)
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2))
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C 371(c)(5))

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3 31 is included.
13. ☒ A **FIRST** preliminary amendment
    ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: International Search Report, German counterpart Search Report and Int'l. Preliminary Examination Report (translated)

EXPRESS NO.: EL302701931US

U.S. APPLICATION NO if known, see 37 C.F.R.1.5	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
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17. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO $860.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482) . . . $690.00		
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) $710.00		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO $1000.00		
International preliminary examination fee paid to USPTO (37 CFR 1 482) and all claims satisfied provisions of PCT Article 33(2)-(4) $100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860.00	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e))	$	

Claims	Number Filed	Number Extra	Rate		
Total Claims	10 - 20 =	0	X $18.00	$	
Independent Claims	2 - 3 =	0	X $80 00	$	
Multiple dependent claim(s) (if applicable)			+ $270.00	$	
TOTAL OF ABOVE CALCULATIONS =				$ 860 00	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).				$	
SUBTOTAL =				$ 860.00	
Processing fee of $130.00 for furnishing the English translation later the ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)) +				$	
TOTAL NATIONAL FEE =				$ 860.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property +				$	
TOTAL FEES ENCLOSED =				$ 860.00	
				Amount to be refunded	$
				charged	$

a. ☐ A check in the amount of $_____ to cover the above fees is enclosed.

b. ☒ Please charge my Deposit Account No. 11-0600 in the amount of **$860.00** to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 11-0600. A duplicate copy of this sheet is enclosed.

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NOTE: Where an appropriate time limit under 37 CFR 1 494 or 1.495 has not been met, a petition to revive (37 CFR 1 137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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By: Richard L. Mayer, Reg. No. 35,982
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Richard L. Mayer
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11/6/00
DATE

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[11150/22]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s)	:	Klaus SCHAAF et al.
Serial No.	:	To Be Assigned
Filed	:	Herewith
For	:	A METHOD AND A DEVICE FOR OPERATING VOICE-CONTROLLED SYSTEMS IN MOTOR VEHICLES
Examiner	:	To Be Assigned
Art Unit	:	To Be Assigned

Assistant Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

S I R:

Kindly amend the above-captioned application before examination, as set forth below.

IN THE SPECIFICATION:

Please amend the specification as follows:

On page 1, before line 1, insert --FIELD OF THE INVENTION--.

On page 1, line 1, delete ", according to the definition".

On page 1, line 2, delete "of the species in Claims 1 and 7,".

On page 1, line 6, insert --BACKGROUND INFORMATION--.

On page 1, line 12, delete "predominantly".

On page 1, line 18, change "Along these lines, a" to --A-- and change "known from EP" to --described, for example, in European Patent No.--.

On page 1, line 19, change "0078014 B 1" to --0 078 014--.

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On page 1, line 21, change "then" to --device-- and delete "means of".

On page 1, line 24, change "DE 3742929 C 1" to --German Patent No. 37 42 929-- and change "set-up to --system--.

On page 1, line 27, change "in such manner," to --so--.

On page 2, line 1, change "From DE 19705471 A 1, it is known to support" to --German Published Patent Application No. 197 05 471 describes-- and delete "," after "system".

On page 2, line 2, change "undertaken" to --performed--.

On page 2, line 4, change "takes place here" to --is performed--.

On page 2, line 6, change "known from" to --described in International Patent Publication No.-- and change "where" to --in which--.

On page 2, line 10, change "DE 4106405C 2" to --German Patent No. 41 06 405--.

On page 2, line 13, change "known from DE 3925589 A 1" to --described in German Published Patent Application No. 39 25 589--.

On page 2, line 14, change "it" to --the array--.

On page 2, line 15, insert --microphone is disposed-- after "another".

On page 2, line 16, change "i. e." to --i.e.,--.

On page 2, line 18, change "left out of consideration here" to --not, however, considered--.

On page 2, line 19, change "In the same way, the" to --The--.

On page 2, line 22, delete "again".

On page 2, line 23, insert the following:
--German Published Patent Application No. 39 25 589 also describes a method, in which a composite signal is formed. The composite signal includes a voice signal and an external noise signal. A detection of the external noise is performed separately. The external noise and voice signals are filtered and subtracted from the composite signal. The results is used to control the filter. This method, however, cannot effectively prevent the occurrence of an echo and/or feedback.--.

On page 2, line 24, insert --it is an object of-- after "Therefore," and change "is based on the object of further developing" to --to provide--.

On page 2, line 25, change "of the species, to the effect" to --for operating voice-controlled systems in motor vehicles so--.

On page 2, delete lines 29 - 33.

On page 3, delete lines 1 - 4.

On page 3, line 5, insert --SUMMARY--.

On page 3, line 6, change "starts out from" to --is based on--.

On page 3, line 7, delete "To".

On page 3, line 8, change "this end, it is also known to set up a" to --A--, delete "," after "system", insert --is provided-- before "to" and delete "also".

On page 3, line 9, change ", and to subtract the noise" to --. Noise-- and change "again" to --are subtracted--.

On page 3, line 12, change "According to the stated object, the essence of the" to --The-- and change "consists in" to --includes--.

On page 3, line 16, change "undertaken" to --performed--.

On page 3, line 18, after "hand." insert --This result is achieved by subtracting the composite signal shifted by Δ F of another, i.e., a second, microphone from the composite signal of a first microphone, the frequency of which has not yet been shifted, and vice versa.--.

On page 3, line 22, change "means" to --conventional systems-- and delete "from the cited related art".

On page 3, line 23, insert --conventional-- before "devices" and delete "of the related art".

On page 3, line 26, change "means known in the related art, or" to --conventional systems and methods and".

On page 3, line 31, change "an elegant" to --a simple and efficient--.

On page 3, line 33, delete ", as such,".

On page 3, line 34, change "is compulsory" to --generally occurs--.

On page 4, line 1, delete "in the mentioned application case".

On page 4, line 9, delete the second instance of "case".

On page 4, line 11, change "i. e." to --i.e.,--.

On page 4, delete lines 13 - 18 and insert the following therefor:

--BRIEF DESCRIPTION OF THE DRAWING

The Figure is a schematic view of a device for operating voice-controlled systems in motor vehicles according to the present invention.

DETAILED DESCRIPTION--.

On page 4, line 20, change "this displayed" to --the illustrated--.

On page 4, line 24, delete "there".

On page 4, line 26, change "can be" to --background noise may include--.

On page 4, line 27, delete "as well as" and delete "but also".

On page 4, line 28, change "contained" to --(total signal) detected--.

On page 4, line 29, change "is made up of" to --may include--

On page 5, line 2, change "part" to --signal--.

On page 5, line 5, change "This means that" to --Thus,--.

On page 5, line 12, insert --,-- after "e.g.", insert --F 1-- before "output" and delete "obtained from M 1".

On page 5, line 20, change "at" to --in--.

On page 5, line 21, insert --,-- after "i.e.".

On page 5, line 25, insert --,-- after "i.e.".

On page 6, line 7, change "it can be said that each" to --the total background noise signal, which may include an echo and/or other noises, is subtracted from every--.

On page 6, line 8, change ", the total" to --.--.

On page 6, line 9, delete "background -noise signal made up of each and other noises is subtracted.".

On page 6, line 10, change "take place" to --occur--.

On page 6, line 12, delete "one and" and delete "action".

On page 7, line 1, change "Claims" to --WHAT IS CLAIMED IS:--.

IN THE ABSTRACT:

Insert the Abstract annexed hereto.

IN THE CLAIMS:

Please cancel original claims 1 - 9 and cancel substitute claims 1 - 7, without prejudice, and add new claims 8 - 17 as follows:

8. (New) A method for operating a voice-controlled system in a motor vehicle, comprising the steps of:

detecting a total signal by a plurality of microphones, the total signal including a voice signal and a background noise signal;

performing a frequency shift by an amount of Δ F on the total signal detected by each microphone;

subtracting the frequency-shifted total signal of a first one of the plurality of microphones from the detected total signal of a second one of the plurality of microphones before shifting the frequency of the total signal of the second one of the plurality of the microphones and vice versa; and

transmitting the frequency-shifted total signal to one of an input to a voice-controlled device and at least one loudspeaker.

9. (New) The method according to claim 8, wherein the voice-controlled system includes at least one of a communication device and a two-way intercom device.

10. (New) The method according to claim 8, further comprising the steps of:

defining an arbitrary acoustic model based on the detected total signals; and

transmitting a signal corresponding to the acoustic model to a respective summation point for subtraction from the detect total signal before the respective frequency shifting.

11. (New) The method according to claim 10, wherein a passenger compartment of the motor vehicle is divided into at least two acoustic subspaces, each of the acuoustic subspaces including at least one microphone location and at least one loudspeaker location;

and wherein the frequency shift is performed between the microphone location of one of the subspaces and the loudspeaker location of another one of the subspaces;

and wherein each acoustic model is defined between the microphone location and the loudspeaker location of the respective acoustic subspace to thereby form a signal-based, closed loop electroacoustical control circuit.

12. (New) The method according to claim 11, wherein each acoustic model is defined in accordance with voice and noise signals detected in the respective acoustic subspace and additional noise signals detected in the entire passenger compartment so that after the signal corresponding to the acoustic model is subtracted from the total signal substantially only the voice signal remains.

13. (New) A device for operating a voice-controlled system in a motor vehicle, the motor vehicle including a passenger compartment divided into at least two subsections, each subsection including at least one microphone and at least one loudspeaker, the device comprising:

a transmitter for transmitting at least one of voice messages and voice commands;

a frequency-shifting device connected between the microphones of one of the subsections and the loudspeakers of another one of the subsections; and

a summation point corresponding to each subsection, the summation point subtractively superimposing a parallelly tapped loudspeaker signal and the microphone signal of the respective subsection.

14. (New) The device according to claim 13, wherein the voice-controlled system includes at least one of a communication device and a two-way intercom device.

15. (New) The device according to claim 13, wherein the subsections are open subsections.

16. (New) The device according to claim 13, further comprising an acoustic model generator provided between each parallel tapped loudspeaker signal and the respective summation point, the acoustic models generated at least one of controlling and postprocessing the respective loudspeaker signal, a resulting signal from each acoustic model generator being transmitted to the respective summation point.

17. (New) The device according to claim 16, wherein the acoustic model generators include sound pattern detectors for separating engine and driving noises from speech-generated acoustical signals and for separating speech-generated signals from fed-back echo signals.

REMARKS

This Preliminary Amendment cancels, without prejudice, original claims 1 - 9 and substitute claims 1 - 7 in the underlying PCT Application No. PCT/EP99/03031. This Preliminary Amendment adds new claims 8 - 17. The new claims, <u>inter alia</u>, conform the claims to U.S. Patent and Trademark Office rules and do not add any new matter to the application.

The above amendments to the specification conform the same to U.S. Patent and Trademark Office rules and do not introduce any new matter into the application.

The underlying PCT Application No. PCT/EP99/03031 includes an International Search Report, dated September 20, 1999, a copy of which is included. The Search Report includes a list of documents that were considered by the Examiner in the underlying PCT application.

The underlying PCT Application No. PCT/EP99/03031 also includes an International Preliminary Examination Report, dated July 18, 2000, a copy of which is included, including a translation.

It is respectfully submitted that the subject matter of the present application is new, non-obvious and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully submitted,

KENYON & KENYON

Dated: 11/6/00

By: ______________________

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ABSTRACT

A device for operating voice-controlled systems, such as communication and/or intercommunication systems in motor vehicles, includes a plurality of microphones and at least one loudspeaker. Voice signals received by the microphones are transmitted to the at least one loudspeaker. The voice signals are subjected to a low-value frequency shift before being transmitted to the loudspeaker(s) or to the input of a voice-controlled device to thereby suppress feedback.

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ART 34 AMDT

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A METHOD AND A DEVICE FOR OPERATING VOICE-CONTROLLED SYSTEMS IN MOTOR VEHICLES

The present invention relates to a method and a device, according to the definition of the species in Claims 1 and 5, for operating voice-controlled systems, such as communication and/or one-way/two-way intercom devices in motor vehicles, where voice signals are picked up by a multiple microphone system and transmitted to at least one loudspeaker.

On the one hand, methods of this type are used in motor vehicles for voice-controlled intercom operation, but they are also used for supporting voice-input controlled electronic or electric modules. In this case, the fundamental problem is that, depending on the operating state, corresponding background noise is present in the motor vehicle. This background noise masks the voice commands. One- and two-way intercom systems in motor vehicles are predominantly advantageous in large vehicles, minibusses, and the like. However, they can also be used in normal passenger cars. Suppressing background noise or filtering out the voice command is still very important in the use of voice-controlled input units for electric components in the vehicle.

Along these lines, a voice-recognition device for a motor vehicle is known from EP 0078014 B 1, where sensors signal or feed into the amplifier system of the voice-recognition device, whether or not the engine is running and/or the vehicle is moving. This then guides a level control, by means of which it is attempted to isolate the voice command from the background noise.

DE 3742929 C1 describes a set-up having two microphones, one of the microphones being disposed at the mouth of the operator, and another in proximity, which is, however, for picking up the structure-borne noise. Both microphone signals are triggered in such manner, that structure-borne noise can be subtracted from the total noise.

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From DE 197 05 471 A1, it is known to support a voice-recognition system, using transverse filtering. In this case, a frequency analysis is undertaken, which is only used for the purpose of recognizing speech commands. No ambient-noise compensation takes place here.

Filtering is known from WO 97/34290, where periodic interference signals are filtered out by ascertaining their periods and canceling them out by interference, using a generator, so that the voice signal remains.

DE 41 06 405 C2 describes a method in which noise is subtracted from the voice signal, a plurality of microphones being used.

The use of a multiple microphone array is known from DE 39 25 589 A1. When using it in the motor vehicle, one of the microphones is disposed in the engine compartment and another in the passenger compartment. Both signals are then subtracted. A disadvantage in this case, is that only the engine noise, i. e. the actual operational noise of the vehicle itself, is subtracted from the total signal in the passenger compartment. Specific ambient noises are left out of consideration here. In the same way, the lack of feedback suppression presents a special problem. Wherever microphones and loudspeakers are arranged in acoustically coupleable proximity, the acoustic signal decoupled at the loudspeaker is fed back into the microphone again. This results in so-called feedback and a subsequent overload.

A similar method is known from DE 39 25 589 A1, where a composite signal made of a voice signal and an external signal is formed. The additional picking-up of external noise takes place separately. The external-noise and voice signals are lead over a filter and are subtracted from the composite signal. Then, the result of the comparison controls the filter. A method of this type cannot effectively prevent the occurrence of echos and feedback.

Therefore, the present invention is based on the object of further developing a method and a device of the species, to the effect that instances of feedback and instability occurring in a system of multiple microphones and loudspeakers are suppressed.

The stated object of the present invention is achieved in a method of the species, by the characterizing features of Claim 1.

Advantageous further refinements of the method are specified in Claims 2 through 4.

Regarding a device of the species, the stated object of the present invention is achieved by the characterizing features of Claims 5. Advantageous further refinements of the device according to the present invention are specified in the remaining claims.

With regard to both the method and the device, the present invention starts out from a communication and/or one-way/two-way intercom device in motor vehicles. To this end, it is also known to set up a multiple microphone system, to also pick up both voice and noise signals, and to subtract the noise signals again from the total signal, so that the filtered voice signal remains.

According to the stated object, the essence of the present invention consists in initially shifting the frequency of the specific microphone signal by a small amount Δ F, and only then transmitting the microphone signal to the loudspeaker(s) or to the input of a voice-controlled device. The frequency shift of the present invention, which is undertaken at a defined position and is not arbitrary, supports the filtering on the one hand, and decouples feedback, and therefore the echo signal, on the other hand, by subtracting the composite signal shifted by Δ F, of another, i.e. second, microphone, from the composite signal of a first microphone, whose frequency is not yet shifted; and vice versa.

Since, without the aforesaid frequency shift of the present invention, feedback is nothing more than the fed-back, amplified voice signal, such feedback cannot be eliminated by means and procedures from the cited related art. This is therefore the case, because devices of the related art only separate the voice signal from the noise signal, and identify the fed-back signal as a voice signal, and not as a noise signal. For this reason, the aforesaid instances of feedback cannot be controlled by the means known in the related art, or cannot be controlled simultaneously.

In contrast, the method and the device of the present invention, the latter of which relates to the connection of the individual elements to one another, eliminate feedback effects in an elegant manner.

Since feedback, as such, always occurs when the microphone and loudspeaker locations are close together, as is compulsory in motor vehicles, the elimination of this feedback is very important in the mentioned application case. This is not only valid in the case of intercom operation, where electroacoustical feedback is uncomfortable for the passengers, but it also has special significance in the use of voice-controlled input interfaces of electrical or electronic components on the vehicle. This only applies when the entire system in the vehicle includes both microphones and loudspeakers, and in this case, also when the input to electrical devices is voice-controlled. Feedback and resulting overloads can cause considerable malfunctions and misinterpretations of the voice command, even in the case of intelligent input interfaces. Depending on the application case, this also constitutes a safety hazard. As an option, noise reduction can also be implemented at the same time, i. e. simultaneously.

The present invention is represented in the drawing, and subsequently described in detail.

The figure shows the principal design, as well as the functioning method, so that both the method steps and the connection of the individual elements of the present invention to each other can be seen in their logical entirety, from the figure itself.

In this displayed exemplary embodiment of the present invention, the vehicle interior is subdivided into two subspaces, namely front and rear.

A microphone M 1 and a loudspeaker L 2 are located in the front section. Microphone M 1 picks up the voice signal there, and possibly picks up noise signals as well. In this case, the noise signal is made up of the background noise in the passenger compartment, which occurs while operating the vehicle. This can be engine noises, wind noises, as well as rolling noises, but also acoustical echo signals from the other subspace, and the like. The composite signal (total signal)

contained at M 1, which is made up of background speech and background noise, is fed to a first summation point S 1. Then, a correspondingly conditioned signal from an acoustic model AM 1 in front is also fed to this summation point. In this exemplary embodiment, the subtraction signal generated in acoustic model AM 1 originates from the signal, which is obtained in the rear section of the vehicle, and is already shifted in frequency. Because this signal, which comes from M 2, is frequency-shifted in F2, and originates from the rear subspace of the passenger compartment, is also taken into account in front on a signal basis, by AM 1, the signal, which is generated in the rear subspace of the vehicle, is acoustically transported up front, into the front subspace of the passenger compartment, and is also registered by M 1, is subtracted again at summation point S 1. This means that the rear subspace of the passenger compartment is acoustically separated from the front subspace of the passenger compartment by device AM 1. That is, the total detectable acoustical signal is initially fed into M 1, and the echo from the rear subspace of the passenger compartment is initially subtracted at summation point S 1. The original signal from the front subspace of the passenger compartment, which is obtained from M 1 in this manner, is then supplied to a frequency-shifting device F 1, and shifted by an amount Δ F, e.g. 5 Hz. The F 1 output signal obtained in this manner is then supplied to loudspeaker L 1 of the rear passenger-compartment subspace and, on the other hand, is simultaneously fed into device AM 2 in the same manner. In this case, AM 2 again represents the acoustic model for the rear subspace of the passenger compartment. A voice message is transmitted in an analogous manner from the rear subspace of the passenger compartment, via M2, to the front subspace of the passenger compartment, via L 2. That is, microphone M 2 registers the voice message together with the background noise in the rear subspace of the passenger compartment, and transmits them to summation point S 2, at which the total acoustical signal picked up by M1, i.e. the echo as well as ambient noises, is subtracted. In turn, the echo-free signal from microphone M 2, which is generated in this manner, is then supplied to a frequency-shifting device F 2, as well, which again shifts the frequency by an amount Δ F. At the output of this frequency-shifting device F 2, the result, i.e. the signal conditioned in this manner, is again supplied to the front subspace of the passenger compartment, namely to loudspeaker L 2 positioned there. The frequency shift for the transmission from the

front to the rear can also be different from the frequency shift from the rear to the front.

All in all, the result is a closed, feedback-free system. The shifting of the frequency is an important feature here, and the echo from the front to the rear subspace, and vice versa, is eliminated by the interaction with the connection via acoustic models AM 1 and AM 2.

However, it is also possible to add a noise-signal subtraction to the echo suppression and feedback elimination. This can also be appropriately taken into consideration in the specific acoustic model AM 1 and AM 2. The additional components necessary for this purpose, such as noise-signal microphones, are not shown here in further detail.

Therefore, it can be said that the total background-noise signal made up of echo and other noises is subtracted from every acoustical input signal from M 1 and M 2, before it is processed further and fed to loudspeakers L 2 and L 1, respectively. So not only does an acoustic decoupling take place between the front and rear subspaces of the passenger compartment, but also the remaining noise signals are quasi compensated for, or subtracted, in one and the same action step.

Claims

1. A method for operating voice-controlled systems, such as communication and/or two-way intercom devices in motor vehicles, where voice signals and background-noise signals are picked up as total signals by a multiple microphone system (M 1; M 2), and transmitted to at least one loudspeaker (L 1; L 2); the total signal picked up from the specific microphone (M 1; M 2) initially being shifted in frequency by an amount Δ F, and only subsequently being transmitted to the loudspeaker(s) or to the input of a voice-controlled device, characterized in that, in order to eliminate feedback and echo signals, the Δ F-shifted total signal of another, i.e. second microphone, is subtracted from the total signal of a first microphone (M 1; M 2), which is not yet shifted in frequency, and vice versa.

2. The method for operating voice-controlled systems as recited in Claim 1, characterized in that, to acoustically couple or subtract the background-noise signals, an arbitrary acoustic model (AM 1; AM 2) is formed from the picked-up, total signals, and is fed as a signal, between the microphone (M 1; M 2) and the respective frequency-shifting (F 1; F 2), to a respective summation point (S 1; S 2) for subtraction.

3. The method for operating voice-controlled systems as recited in Claim 2, characterized in that the passenger compartment of the vehicle is divided up into at least two acoustic subspaces, in such a manner, that at least one microphone location and at least one loudspeaker location are provided in each subspace; that the aforesaid frequency shift, Δ F, takes place between the microphone location of the one subspace and the loudspeaker location of the other subspace; and that the aforesaid acoustic models (AM 1; AM 2) are used between the loudspeaker locations and microphone locations of the one subspace, and between the loudspeaker locations and microphone locations of the other subspace, so that a signal-based, closed-loop electroacoustical control circuit is formed.

4. The method for operating voice-controlled systems as recited in Claim 3, characterized in that, by means of the aforesaid acoustic models (AM 1; AM 2), not only are voice and/or noise signals of the different passenger-compartment subspaces taken into consideration, but also additionally detected noises in the entire field are considered and subtracted from the total sound signal, so that the voice signal essentially remains.

5. A device for operating voice-controlled systems, such as communication and/or two-way intercom devices in motor vehicles, having a plurality of microphones and loudspeakers, as well as means for transmitting voice messages or voice commands, characterized in that the passenger compartment in the motor vehicle is subdivided into at least two, and if indicated, open subsections (front, rear) having at least one microphone (M1, M2) and at least one loudspeaker (L1, L2); that the aforesaid means also include frequency-shifting devices (F1, F2), which are connected between one of the microphones (M1, M2), respectively, and the respective loudspeaker located in the other subsection (front, rear); and that the respective, resulting loudspeaker signal can be parallelly tapped and, by means of summation points (S1, S2), superimposed in a subtractive manner, over the microphone signal in the same subsection.

6. The device for operating voice-controlled systems as recited in Claim 5, characterized in that means (AM1, AM2) are provided between the parallel tapping of the loudspeaker signal and the respective summation point (S1, S2), the means being used to generate so-called acoustic models, which control and/or postprocess the respective loudspeaker signal; and in that the resulting signal of these means (AM 1; AM 2) is fed to the respective summation point (S 1; S 2).

7. The device for operating voice-controlled systems as recited in Claim 6, characterized in that the acoustic models (AM 1; AM2) include means for detecting sound patterns, the means being used for separating engine and/or driving noises from speech-generated, acoustical signals, as well as being

used for separating primarily speech-generated signals from fed-back, echo signals.

COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below adjacent to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **A METHOD AND A DEVICE FOR OPERATING VOICE-CONTROLLED SYSTEMS IN MOTOR VEHICLES**, and the specification of which:

[ ] is attached hereto;

[ ] was filed as United States Application Serial No. _____ on _____, 19__ and was amended by the Preliminary Amendment filed on _____, 19__.

[X] was filed as PCT International Application Number PCT/EP99/03031 on the 4th day of May 1999.

[X] an English translation of which is filed herewith.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a). I hereby claim foreign priority benefits under Title 35, United States Code § 119 of any foreign application(s) for patent or inventor's certificate or of any PCT international applications(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

EL302701931

PRIOR FOREIGN/PCT APPLICATION(S)
AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119

Country: Federal Republic of Germany

Application No. 198 20 000.5

Date of Filing: May 6, 1998

Priority Claimed
Under 35 U.S.C. § 119: [X] Yes [ ] No

Country: Federal Republic of Germany

Application No. 198 27 134.4

Date of Filing: June 18, 1998

Priority Claimed
Under 35 U.S.C. § 119: [X] Yes [ ] No

I hereby claim the benefit under Title 35, United States Code § 120 of any United States Application or PCT International Application designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations § 1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR
PCT INTERNATIONAL APPLICATIONS
DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. § 120

U.S. APPLICATIONS

Number :

Filing Date :

PCT APPLICATIONS
DESIGNATING THE U.S.

PCT Number :

PCT Filing Date :

I hereby appoint the following attorney(s) and/or agents to prosecute the above-identified application and transact all business in the Patent and Trademark Office connected therewith.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

1-00

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